

# **2019 ESA Workshop on Aerospace EMC (Aerospace EMC 2019)**

**Budapest, Hungary  
20-22 May 2019**



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## Monday 20 May 2019

08:00 **Registration**

09:40 **Welcome & Opening**

### ORAL SESSION

#### Session 1: EMC control, Management and standardization

*Session Chair: L. Nagy*

10:00 Solar orbiter strategies for EMC control and verification 1  
*L. Malin, Airbus*

10:20 Aviation equipment and the application of the Radio Equipment Directive (RED) 7  
*R. Kebel, Airbus*

10:40 *Coffee break*

#### Session 2: EMI analysis and predictions (1)

*Session Chair: R. Kebel*

11:10 Numerical investigation of the stochastic field-to-wire coupling to transmission lines with small bend angles 12  
*J. Kasper, Otto-von-Guericke-University*

11:30 Measurement of the field-to-wire coupling to transmission line networks of shielded cables in a reverberation chamber 17  
*M. Magdowski, Otto-von-Guericke-University*

11:50 Mixed-mode S-parameter measurements for determination of cable coupling 22  
*J. Lansink Rotgerink, Netherlands Aerospace Centre*

12:10 Ways of improvement for HIRF transfer function assessment on rotorcraft 28  
*C. Bastard, Airbus*

12:30 Time domain investigation of the plane wave coupling to a non-linearly loaded transmission line network 34  
*J. Kasper, Otto-von-Guericke-University*

12:50 *Lunch time*

#### Session 3: Measurement techniques and test methods (1)

*Session Chair: A. Enders*

14:10 Transmission factor measurement based impedance characterisation utilising a double current probe assembly 40  
*M. Harm, TU Braunschweig*

14:30 Scaled measurements of timevariant GNSS propagation channels 46  
*O. Kerfin, TU Braunschweig*

14:50 Characterization of EMI/EMC ground test facility for electric propulsion thrusters by means of iterative physical optics 52  
*F. Puggelli, University of Siena*

15:10 Reliable distance scaling of AC magnetic fields for space mission verification campaigns 58  
*C. Trenkel, Airbus*

15:30 *Coffee break*

### **16:00 POSTER SESSION 1**

#### **Measurement techniques and test methods (P1)**

P01 Modular circular waveguide antenna system for arbitrary pattern synthesis in scaled measurement environments 67  
*A. Vaske, TU Braunschweig*

P02 Susceptibility detection of analog and digital circuits 73  
*I. Marziali, Thales Alenia Space*

P03 The use of the FIR filter to detect malfunctions induced by interference 78  
*D. Boschetti, Thales Alenia Space*

P04 Fast magnetic emission tests for continuous measurements around an equipment under test 84  
*T. Hartman, University of Twente*

P05 Hazards of Electromagnetic Radiation to Ordnance (HERO) instrumentation developments for High Intensity Radiated Field (HIRF) testing of aircraft 89  
*E. Dunkin, QinetiQ*

#### **EMI analysis and predictions (P1)**

P06 Reverse EMI behaviour of DC-DC converters 95  
*S. Moser, German Aerospace Center*

P07 Characterisation of inter-cavities EMC coupling in a telecommunication satellite 101  
*M. Terral, Thales Alenia Space*

P08 Lumped resonator and Kron-Branin hybrid model of apertured enclosure shielding effectiveness 106  
*T. Soeun, Safran Tech*

P09 Generating radome geometries for full lightning protection studies 112  
*A. Vukovic, University of Nottingham*

#### **Magnetic cleanliness**

P10 Adaption of magnetic cleanliness facilities and procedures to overcome the new challenges of the scientific missions 117  
*M. Díaz-Michelena, Space Magnetism Laboratory*

18:00 *Welcome Reception*

## Tuesday 21 May 2019

### ORAL SESSION

#### Session 4: EMI analysis and predictions (2)

*Session Chair: S. Pignari*

- 08:30 Effect of RF spurious radiation from units on a satellite VHF receiver 122  
*E. Scione, Thales Alenia Space*
- 08:50 EMC specifications update for integration of passive RFID systems in spacecraft for assembly, integration and tests operations 127  
*A. Piche, Airbus D&S*
- 09:10 Decoupling of ground plane effect on low frequency magnetic and electric field measurements & modelling 132  
*E. Chatzineofytou, National Technical University of Athens*
- 09:30 Validation of a physical-based model for a Spacewire cable 138  
*R. Trincherio, Politecnico di Milano*
- 09:50 EMC assessment for pre-verification of THOR mission electromagnetic cleanliness approach 144  
*C. Nikolopoulos, National Technical University of Athens*

10:10 *Coffee break*

#### Session 5: EM environment and EMI effects

*Session Chair: F. Lescoat*

- 10:40 Volcanic ash effects on avionics – identification of electromagnetic hazards and design of test bench 150  
*R. Nunes, German Aerospace Center*
- 11:00 Laser ranging signal detection in harsh EMC environment 156  
*T. Behnke, German Aerospace Center*
- 11:20 International requirements for multi-platform reuse methodology 162  
*P. Edwards, A.I. Solutions*

11:40 *Break*

#### Session 6: Measurement techniques and test methods (2)

*Session Chair: F. Leferink*

- 11:50 Alternative approaches to radiated susceptibility testing at unit level: trade-off analysis of proposed solutions 168  
*G. Spadacini, Politecnico di Milano*
- 12:10 Measurement time considerations for FFT-based receivers and data reduction for result display 174  
*M. Keller, Rohde & Schwarz*
- 12:30 AMBRE: a compact instrument to measure thermal ions, electrons and electrostatic charging onboard spacecraft 178  
*B. Lavraud, IRAP*

12:50 *Lunch time*

**Session 7: Magnetic cleanliness**

*Session Chair: D. Boschetti*

14:10 Lessons learned from flight observations of the GOES-R magnetometer 183  
*J. Kronenwetter, NASA*

14:30 Advances in reaction wheel design for magnetic cleanliness 189  
*L. Norman, Airbus*

14:50 Towards a magnetically clean reaction wheel with active magnetic field mitigation 195  
*A. Nicolai, Astro- und Feinwerktechnik Adlershof*

15:10 Enhanced magnetic coil facility for magnetic cleanliness, characterization and susceptibility 201  
*M. Cucca, Thales Alenia Space*

15:30 *Coffee break*

**16:00 POSTER SESSION 2**

**Measurement techniques and test methods (P2)**

P01 EMC testing approach for power distribution unit of small satellite 207  
*M. Borsi, Budapest University of Technology and Economics*

P02 EMC aspects of the LMP experiment aboard ESEO 213  
*V. Qiao, Budapest University of Technology and Economics*

P03 Challenges of time domain near field measurement of complex digital circuit 219  
*Y. Zhao, Sichuan University*

P04 Shielding effectiveness measurements on satellite microwave passive elements using reverberation chamber test method 223  
*T. Serge, Thales Alenia Space*

P05 Influence of injection point selection on military low frequency immunity test results 229  
*S. Cakir, Tubitak UME*

P06 Installation of an electromagnetic test facility in Hungary 234  
*G. Erdos, Hungarian Academy of Sciences*

**EMI analysis and predictions (P2)**

P07 Steady state emissions modeling of low frequency magnetic and electric fields generated by GOCE CDMU 239  
*A. Baklezos, National Technical University of Athens*

P08 Reduction of EMI in transmit/receive modules for space systems 244  
*A. Fina, Thales Alenia Space*

P09 A model for RF coupling on spacecraft antennas 249  
*E. Scione, Thales Alenia Space*

19:00 *Gala dinner*

## Wednesday 22 May 2019

### ORAL SESSION

#### Session 8: EMI analysis and predictions (3)

*Session Chair: F. Canavero & R. Perraud*

- 08:30 On the maximum expected electric field in electrically small, undermoded enclosures 253  
*P. Bremner, RobustPhysics*
- 08:50 Enhanced geometrical model of complex cable bundles through accurate polynomial representation of cable trajectories 261  
*X. Liu, Politecnico di Milano*
- 09:10 High-frequency electromagnetic coupling calculation using the dynamical energy analysis by discrete flow method 266  
*D. Thomas, University of Nottingham*
- 09:30 *Break*
- 09:50 Conducted coupling analysis of flat cabling structures for launcher applications: electrostructural composite 272  
*J. Aspas Puértolas, ArianeGroup*
- 10:10 Spice modeling of probes for pulse current injection 278  
*G. Spadacini, Politecnico di Milano*
- 10:30 Prediction of electronic unit radiated emissions from both PCB near field and shielding enclosure characterization 284  
*F. Höpffe, Nexio*
- 10:50 *Coffee break*

#### Session 9: Magnetic cleanliness (2)

*Session Chair: D. Boschetti*

- 11:20 Meeting the EMC challenges for in-situ field measurements on the Juice mission 290  
*P. Brown, Blackett Laboratory*
- 11:40 Determination of magnetic effect of the 600°C hot plate setup for testing the heat shield of solar-orbiter 296  
*H. Kuegler, IABG*
- 12:00 Magnetic field perturbations by thermoelectric effects 301  
*N. Ferreira, Critical Materials*
- 12:20 *Lunch time*

#### Session 10: EMC of communication and data systems (3)

*Session Chair: F. Silva*

- 13:40 EMC investigations on Ethernet link for avionic application 307  
*R. Perraud, Airbus*
- 14:00 Scattering interference from large spacecraft and causal effects on launch vehicle antenna performance 312  
*P. Edwards, NASA*

14:20 EMI tight rectangular connector assemblies development 319  
*A. Thouand, Airbus D&S*

14:40 *Coffee break*

**Session 11: Measurement techniques and test methods**

*Session Chair: D. Thomas*

15:00 Polarimetric decomposition of the complex electromagnetic field for EMC aerospace testing 325  
*S. Cappa, Università degli Studi di Napoli*

15:20 Contactless vector network analysis of embedded two-port test objects 331  
*L. Oppermann, TU Braunschweig*

15:40 Procedure for radiated susceptibility tests in thermal vacuum chambers 336  
*G. Andrieu, XLIM Laboratory*

16:00 *Closing*